why they should be so singled out is not stated. There is a considerable collection of development formulæ in addition to the above, but only one here and there has the name of its author attached. It would have been better if the author's name had been given in every case, with a reference to the source whence the formula was obtained. Various fixing solutions are given, neutral and acid, one including "acetone-sulphite," but alkaline fixing baths are not represented. Among "stain removers," too, weak alkaline solutions do not appear to be mentioned, though they are the best solvents of the coloured oxidation products of developing reagents.

In a few cases the compiler has ventured to state that one or the other formula is "the best," without quoting any authority or giving any reason for the preference. Among "hypo. eliminators," for example, "the best is plain water," but potassium percarbonate "is the best chemical destroyer of hypo." A soluble hypochlorite was the first "hypo. eliminator" suggested, now many years ago, and it remains unsurpassed, if equalled. It is, however, not mentioned here, and its omission is not due to the ease with which, if carelessly used, it attacks the silver image itself, because sodium hypochlorite is given as a stain remover.

Each of the thirty-three chapters is on a different subject, ranging from "The Studio" and "The Workroom," and the various operations that are generally understood as practical photography, to the "Facts of Copyright" and "Toilet and Hygiene." This last section treats of stained finger-nails; eyes affected by the coloured light of the dark room; skin irritation caused by developers, potassium bichromate, &c.; and similar subjects. The volume is full of information, and cannot fail to prove useful to the photographer who keeps it at hand.

U. S. Department of Agriculture. Field Operations of the Bureau of Soils, 1901. Third Report. Pp. 647+case containing thirty-one maps. (Washington: Government Printing Office, 1902.)

THE book under notice constitutes the third of the series of reports on the work of the Division of Soils, which is engaged in mapping the distribution and describing the agricultural characteristics of the various soil types met with in selected areas of the United States. The general scope of this remarkable undertaking has already been discussed in these columns when reviewing the Report of 1900 (NATURE, November 6, 1902); the present volume shows that the work of the Division has so far been appreciated by Congress that its progress has been assisted by increased appropriations, enabling it to enlarge its working staff and cover a greater area in its annual survey. The reports now presented deal with the most diversified types of land, and speak of the variety in the conditions under which farming is carried out in the United States. On the one hand, we read of intensive systems of agriculture, analogous to our own, as in New Jersey and Pennsylvania, old settled districts in touch with large centres of population, farming high, and either purchasing fertilisers or keeping stock to make manure; then we pass, as a contrast, to parts of Virginia and Georgia, which were ruined by the war and left without capital or energy, where it is still the custom to crop out the soil by continuously growing corn or wheat, and then clear a fresh farm, leaving the old land to fall back to scrub until it accumulates sufficient decayed vegetable matter to be worth breaking up again.

In the western States the contrasts are just as great between the arid regions, which are still "dry farmed," and can only produce a crop of barley or wheat every other season, the land being fallowed in the intervening years to gather two years' rainfall for the needs of one crop, and the rich irrigated land of California, famous for oranges, apricots, and other valuable fruits.

Two of the most interesting crops which come in for notice in this book are tobacco and sugar beet; in both cases the industry is being very rapidly developed in the United States; indeed, the production of beet sugar is an affair of the last two or three years only, and the expansion has been largely brought about by the energy and advice of the Division of Soils. Anyone seeking a striking example of the way a State can utilise scientific research for the fostering of a national industry cannot do better than study the work on tobacco of the United States Department of Agriculture.

Interesting as these volumes are to the agriculturist from the variety of the crops and the farming conditions described, they are equally valuable to many students of pure science; to the botanist they form a treatise on what might be called applied ecology, to the chemist and physicist the "alkali land" problems will appeal; the geographer will find illustrations, often accompanied by excellent photographs, of the most varied types of land surface and the changes to which they are subject; while the economist, as noted above, may obtain abundant material for his special study. An accompanying report sets the whole cost of the Division of Soils as a little under 8000*l.* for the year 1901; of this, the Soil Survey, exclusive of laboratory work, required a little less than half, 3·53 dollars per square mile for the 5596 square miles covered in the year, or almost exactly a farthing per acre, not an excessive charge on the capital value of the land! A. D. H.

Theoretical Organic Chemistry. By J. B. Cohen, Ph.D. Pp. xv + 578. (London: Macmillan and Co., Ltd., 1902.) Price 6*s.*

THE author commences his preface with an apology for bringing out a new book on organic chemistry. We are not, however, prepared to agree with Dr. Cohen that an apology is necessary. There are not very many good and complete text-books on organic chemistry in this country, therefore a new book—provided that it is good—would not be at all out of place. At another place in his preface the author says, "The production and uses of common materials, which come under our daily observation, are frequently relegated in some text-books of organic chemistry to a background of small print; in others entirely omitted." Dr. Cohen particularises such substances as lanoline, linseed oil, gelatine, the tannins, turpentine, &c. Our interest is at once aroused and we turn up turpentine, and this is what we find:

"Turpentine oil is used as a solvent in the preparation of varnishes, for mixing with pigments, as an embrocation, &c. It absorbs oxygen, when heated in presence of water, and the oxygenated water is employed as a disinfectant and deodoriser."

There is very little here about the production of turpentine. We then turn to linseed oil; here we are more fortunate, because there are seventeen lines devoted to telling us that the oil may be used for preparing linoleum, oil-cloth, and that it is employed in making varnishes and paints—but not a word as to its production. Again, the treatment of gelatine, tannin and lanoline can scarcely be called exhaustive. We are not at all sure that it is desirable in a text-book, the size of the one before us, to describe such substances in detail, but when the author lays claim to treat them more fully than they are treated in other text-books, one is rather surprised to find them dismissed with such scanty notices.

Of course, details of this kind do not condemn a book, and, in many respects, the book is very good.

We have read some of the chapters with considerable interest and pleasure, notably those which deal with the phenols and with the carbohydrates, the subjects of which are carefully and fully dealt with. In some parts of the book, however, the explanations are not so clear as we could have wished, the reactions being given with little or no attempt at an explanation. Now the average student requires a considerable amount of explanation in order that he may understand the subject. As an example of want of clearness we think it would have been wise to give some explanation of the probable mechanism of the process involved in the preparation of benzaldehyde by the action of metallic nitrates on benzyl chloride, and some explanation of Reimer's reaction would not have been out of place.

The book is well printed, and the proofs have evidently been very carefully corrected. Taken as a whole, we consider Dr. Cohen's book a very useful compilation; from the preface we had expected to find a book written on new and original lines; in this, however, we were disappointed. F. M. P.

Nature Studies (Plant Life). By G. F. Scott Elliot. Pp. viii + 352. (London: Blackie and Son, Ltd., 1903.) Price 3*s.* 6*d.*

IT is not evident whether the author intends this book as a contribution to the subject of "nature-study," which is now attracting so much attention. Certainly the first and most essential feature of nature-study, namely, personal observation, is not emphasised, nor is the discursive style which the author adopts calculated to induce careful and accurate investigation. A large mass of information has been brought together, compiled from books on bionomics and original papers. The book begins with the flower and fruit, and the vegetative portions follow, an arrangement which has its advantages since morphology is sacrificed to bionomics. The relations between animals and plants are well brought out, but less prominently so the relations between plants *inter se*. The study of plant associations begins with the Cryptogams, and here, as indeed in most of the chapters, the matter is too fragmentary; only occasionally, as, for instance, in the chapters on seaweeds, or when describing the lichens, does Mr. Scott Elliot take the necessary space to do justice to himself and his subject. The concluding chapters dealing with the origin and development of the English flora introduce a subject which is well worth studying.

Das Objectiv im Dienste der Photographie. By Dr. E. Holm. Pp. xvi + 142. (Berlin: Gustav Schmidt, 1902.) Price 2 marks.

THOSE photographers, whether professional or amateur, who are able to read German will find this book full of useful information and valuable hints regarding the properties and use of the photographic objective. So numerous, so varied in construction, and so different in price are lenses of to-day that it is important that the photographer should know something of their nature and capabilities before investing in one or more of them. The present book is intended to give the reader a good all-round idea of not only the properties of lenses, their errors, corrections, the different kinds available, and hints on choosing them, but also how to use them when obtained. Although the text quite fulfils this object, the very excellent set of reproductions illustrating all the kinds of results which accrue from good or bad focusing, setting, choice of position, &c., adds greatly to its value, and demonstrates better than any words could do the points to be observed. The telephotographic lens is also included in these pages, and the book concludes with quite a full index.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Permanent Electric Vibrations.

IN his "Electric Waves" (see p. 361) Mr. Macdonald considers that electric waves may be propagated round a ring without being subject to any loss by radiation. The question whether this is possible is of great interest, as such waves might play an important part in atomic phenomena. It seems, however, that such waves cannot exist, except possibly in exceptional cases. For consider a spherical surface to be drawn enclosing the whole of the vibrating system. The electric force cannot vanish at all points of this surface, for the sphere may be as close to the conductors as we please. From the value of the force, and the condition that at infinity any motion that there may be must consist of outwardly progressing waves, we can find by spherical harmonic analysis the field at any point outside the sphere. The result is that in any case the field cannot at all distant points be of an order lower than that of $1/r$; there must be loss of energy by radiation. For a thin circular wire a fundamental mode of vibration is determined, to a first approximation at least, in *Proc. Camb. Phil. Soc.*, vol. ix. p. 326; and the case of a wave progressing round the wire can be deduced by compounding two such vibrations differing in phase. The determination of the resultant disturbance at a great distance involves Bessel's functions in general, but it can be proved without difficulty that for points on or near to the axis of the ring it consists of divergent waves. The consequent rate of loss of energy is of the order of unity, while the energy held is of the order of $\log(a/\epsilon)$, where ϵ is the radius of the wire and a that of the circle. The decrement is hence of the order of $1/\log(a/\epsilon)$, as found in the paper referred to.

On the other hand, it is hard to find a flaw in Mr. Macdonald's general reason for the absence of radiation in this case, and the possibility of non-radiating systems is suggested by the case of a uniformly and superficially charged dielectric sphere of unit specific inductive capacity. If it performs small simply periodic oscillations, each point of its surface may be treated as a Hertzian oscillator. On evaluating the external field, we find that the variable part of it is the same as if the charge were collected at the centre and multiplied by $(\sin \lambda a)/\lambda a$, where a is the radius of the sphere, and $2\pi/\lambda$ is the wave-length in free ether corresponding to the frequency of the oscillation. Hence, if this wave-length is a submultiple of the diameter of the sphere, there is no external oscillating field.

H. C. POCKLINGTON.

The Bearing of Recent Discoveries on the Physics of Taste and Smell.

ONE of the first experimental papers on the nature of the stimulus given to the organs of taste or smell by sapid or odorous substances is, I think, that by the Hon. R. Boyle ("Experiments and Observations about the Mechanical Production of Tasts (*sic*)," London, 1675), in which he puts forward a theory of irritation by particles which penetrate and irritate more or less according to their size and shape. After this a chemical theory of taste seemed to gain ground, and Graham laid down the principle that only soluble substances are sapid, and that further only crystalloid solutes are sapid (see Bain, "Senses and Intellect," 1864). Then in 1882 Sir W. Ramsay very tentatively put forward a dynamical theory from analogy with optics and sound (NATURE, xxvi. 187). He proposed that very light molecules vibrating at a high rate are inodorous, taking as the limit a molecular weight of about 30. On the other hand very heavy molecules would be odourless, because vibrating too slowly, whereas those vibrating at a rate between these limits would find the nerve-cells capable of response. Thus he accounted for the want of odour on the part of H, CH_4, O, N, H_2O, &c. Similar views were later ex-